

ELECTROMAGNETIC FIELDS (EMF) FOR SOIL PEST CONTROL AS A MeBr ALTERNATIVE: EFFICACY AND TECHNOLOGY.

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~~Effectiveness~~**Efficacy**: The potential value of electromagnetic fields (EMF) in agriculture was recognized nearly 60 years ago by Ark and Perry ~~(2)~~. In the intervening years EMF has been used for devitalization of seeds (~~11~~**13**), pasteurization of raw milk (**810**), control of rice weevils (~~10~~**12**), control of weeds (**57**), and control of nematode populations (**911**). That EMF exposure is effective against soil borne pests and pathogens is well documented (**3,4,5,67,8,9,311,1815,17,20,23**). The frequencies of interest are in the range 10 MHz to 10 GHz.

Economics of creating EMF in the soil for pest control are assessed in a companion presentation. The remainder of this presentation will be used to describe and assess the new technology.

Technology and the state of the art: The present technology is an outgrowth of an observation made at Texas A&M in 1971 that EMF is toxic to weeds and weed seeds in soil. The Phytos company conducted biological, engineering, and field research under a licensing agreement with Texas A&M, and designed, built, and tested EMF field prototypes in the 1970s. These EMF delivery systems were effective in pest control, but not practical ~~(17)~~ because of a high energy requirement. The challenge was and is to find means to use EMF that reduce energy requirement by increasing efficiency and decreasing machine size and cost.

Bioterm was formed in 1993 to study, support, and promote the use of EMF for pest control in soil. We have focused on applicator and power supply design, and on enhancing biocidal efficiency. Following are the principal developments in the state of the art that have occurred in the past two decades:

COMPONENT	1975	1998
•• Electrical generator weight (Including motor)(lbs)	30,000	000 1200
•• Applicator efficiency (ability — to deliver energy uniformly to — a specified location within the — soil profile)) 5%	% 85%
• Cost of magnetron/ancillary — power system (\$/KW)	3000) 3000 200
• Magnetron efficiency (%)	%) 60 -75	75 90-95

- Biocidal Efficiency (J/cm³

required for pest control) 50
10**

50

** Laboratory finding--not yet studied under field conditions

105-1

11. The first four improvements, taken together, constitute a massive increase in operating efficiency. The fifth, should it be demonstrated to occur under field conditions, would decrease energy requirement by about a half-order of magnitude, with concomitant decreases in breakeven costs.

— The first four improvements, though field-tested separately, have not yet been united into a field prototype. Clearly, this is an urgently needed next step if the use of EMF represents an alternative to MeBr in soil pest control.

Pertinent Literature

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